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Reviews

The Cost of Mining. By James R. Finlay. Third edition (entirely revised, enlarged, and reset). McGraw-Hill Book Co., 1920.

The new edition of this standard work on mining costs in addition to amplifying and bringing up to date the data on mining costs found in the earlier editions, contains a considerable amount of material of broader economic interest relating to mineral resources. Chapter I, for example, discusses mineral wealth as a source of national power, chapter III treats of the nature and use of capital.

The cost of mining data is presented seriatim by mineral commodities and covers coal, iron, copper, lead, silver-lead, zinc, gold, and silver. The chapter dealing with each of these is commonly prefaced by some general discussion and by statistics of production. Cost data for iron-mining relate only to the Lake Superior region.

In the chapters devoted to copper occur such paragraph headings as "Geologic Unconformities at Jerome," "Characteristics of Belt Rocks," "Theories of Formation of Jerome Deposits," etc.; the book is therefore somewhat broader in scope than its title would suggest. The book commends itself not only to the engineer but to the economist, geologist, or geographer concerned in the rôle of mineral resources in the industrial life of the United States.

E. S. Bastin

Extracts from "The Mining Handbook," Geological Survey of Western Australia, Memoir No. 1, 1919. A series of advance separates of chapters from the foregoing *Handbook.*

This mining handbook is a worthy attempt to furnish to those interested in mining in Western Australia a large amount of varied information likely to prove of service to them in the exploitation of mineral deposits. The handbook includes chapters on the relations of physiography and of petrology to the exploitation of mineral deposits, chapters expounding the mining regulations and explaining various methods of governmental assistance to prospecting and mining. Then follow chapters dealing with the major base metals, with the various steel-alloying metals, with the minor metals, and, finally, with coal and a few non-metallic mineral resources.

The chapter on physiography in its relation to prospecting and mining is mainly a discussion of the influence of topography on the discovery and development of ore bodies and, reciprocally, the influence of ore bodies on topography.

The chapter on minerals of economic value lists the composition and the principal physical properties of economic minerals and cites their main utilizations.

The chapter on petrology and its application in industry is an exposition of petrology in its simplest form, defining the principal rock-forming mineral and the principal groups of igneous, sedimentary, and metamorphic rocks and expounding the application of petrology in geologic surveying, in the study of ore deposits, in engineering, architecture, and agriculture.

The chapter on the relation of the law to prospecting and mining covers the legal restrictions governing the location and development of mineral deposits in Western Australia. Three points of contrast between the Western Australian mining laws and those of the United States are noteworthy. In the United States, discovery must precede the staking out of mining claims and ground cannot be validly held until there has been an actual discovery of mineral. In Western Australia ground can be marked out and held, even though no minerals have been discovered. In the United States title in fee simple to a mining claim is acquired by patent, subject to extra-lateral rights of adjoining claim-owners. In Western Australia the crown does not part with the title to the land. Leasehold is the rule, coupled with labor conditions.

In Western Australia the principle of extra-lateral rights, which has resulted in so much troublesome litigation in the United States, does not apply but the holder of a mining lease is only entitled to such portions of the lode or lodes as occur within the boundaries of his lease extended vertically downward from the surface.

An interesting feature of the Western Australian mining law is the provision for a reward of up to one thousand pounds, offered for the discovery of payable gold at a place distant more than two miles from any place where payable gold has up to then been discovered. Several other forms of governmental assistance to mining include advances for the purpose of pioneer mining and prospecting, the establishment and subsidizing of plants for ore treatment, assistance for drilling, including the purchase or hire of drilling plants, the advancement of money for drainage, shaft sinking, and for development of transportation facilities to assist mining operations. A separate chapter, entitled "Assistance to Prospecting and Mining," explains these various forms of governmental assistance in detail and also lists geographically and by minerals all available government reports and maps covering mining districts. Another chapter is a glossary of common terms in mining and geology.

Among the major metals, iron ores though widely distributed in Western Australia have as yet been developed only on a small scale for the production of flux for copper and lead smelting and no detailed geologic surveys have been made of any of the iron deposits. Copper deposits, though widely distributed, have been developed only to a minor degree. The production of lead ores has been small.

Among the steel hardening metals, the production of manganese, tungsten, and molybdenum has been so small as to be essentially negligible. Among the rare metals, there has been little or no development.

The small tin production has come mainly from alluvial deposits, but in the Wodgina tin field, tin and tantalum occur in pegmatite dikes which, together with granite, intrude metamorphic sedimentary rocks. The chief constituents of these pegmatitic dikes are albite and quartz, with occasionally scaly lepidolite and tourmaline; in addition, orthoclase, mangano-tantalite, and tin occur in varying quantities, as well as some of the rare radioactive minerals. In the vicinity of and along the margin of many of the pegmatite dikes are bands and bunches of tourmaline, sometimes to such an extent as to make up fully one-third of the entire rock. One of the most conspicuous of the pegmatite veins, about half a mile in length and 30 feet in width, has proved to be sufficiently rich in tin and tantalum to be worked.

The tin ore, cassiterite, is concentrated along certain lines in the pegmatites and does not appear to be generally disseminated in minute quantities throughout its mass. The tin occurs in all shapes, from minute grains up to pieces weighing as much as 100 pounds.

The coal deposits of Western Australia range in age from Carboniferous, through Permo-Carboniferous to Mesozoic, Tertiary, and post-Tertiary. The only deposits which have been extensively mined are those of the Collie field of Permo-Carboniferous age. In this field the total thickness of the coal seams is about 137 feet. The coals are semi-bituminous, non-coking coals which are dirty to handle and deficient in volatile materials. It is interesting to note that the coals appear to be mainly of drift origin and to have been deposited by current action on an extensive basin or river valley. The banded appearance of most of the coals and their relatively high percentage of ash is probably a result from this mode of origin as is also the absence of fire clays beneath them. The available reserves of the field are estimated at three and one-half billion tons.

E. S. BASTIN

Summary Report, Canadian Geological Survey. Ottawa, 1919. *Part C. Alberta-Saskatchewan Region.* Pp. 52.

1. "Cretaceous, Lower Smoky River, Alberta." By F. H. McLEARN.
2. "Geology of the Swan Hills in Lesser Slave Lake District, Alberta." By JOHN A. ALLEN.
3. "Northern Part of Crowsnest Coal Field, Alberta." By BRUCE ROSE.
4. "Gasoline in Natural Gas. Experiments on Alberta Gas." By D. B. DOWLING.
5. "Surface Deposits of Southeastern Saskatchewan." By J. STANSFIELD.

The annual *Summary Report of the Canadian Geological Survey* for 1917 and since is issued in parts and each part is designated by a letter of the alphabet. Before 1917 the whole annual *Summary* was bound in one large volume.

1. The Cretaceous begins with the Lower Cretaceous and extends into the Montana group of the Upper. Marine and non-marine formations alternate and the total thickness represented is about 4,470 ft. The Dakota sandstone cannot be recognized in its normal subaerial development. The beds dip to the south from 12 to 60 ft. per mile and represent the north limb of a very broad, shallow syncline. The structure is not favorable for oil.

2. The Swan Hills lie south of Lesser Slave Lake, have a maximum elevation of 4,320 ft. above sea-level, and represent remnants of a once more extensive, maturely dissected upland. The Cretaceous is represented by the Montana group. The basal member is marine, and the upper two members, the Sawbridge and Edmonton, are of fresh-water origin. The early Tertiary is represented by the Paskapoo formation but there is no marked unconformity between the Upper Cretaceous and the Tertiary.

3. Formations ranging from Devono-Carboniferous to Upper Cretaceous, probably Tertiary, in age, are described. Coal seams of